

## PROPERTIES OF AEROSOLS

### FOREWORD

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Many of the problems in the atomic energy program involve the handling of small particles. Some of the operations produce radioactive wastes in the form of dust, fume, and mist which would create hazards if considerable quantities were released in or near the installation. Much progress has been made in the methods of handling these materials to prevent contamination of the atmosphere, but there is still much more to be learned about the fundamental properties of finely divided material suspended in gases and the practical application of this field of science to industrial problems. The problem of waste disposal is not unique to the atomic energy industry. Many large industries must dispose of obnoxious gases and aerosols created in the course of their operations. This industry differs from others, however, in that permitted tolerances must be lower when the waste materials are radioactive. Careful monitoring must be maintained at all times to cope with accidental releases, and operations can be carried on only with the full realization of the effect of the meteorological conditions in the dispersion of stack gases.

The objective of the aerosol work at the University of Illinois is to make fundamental studies of the properties and behavior of aerosol particles and aerosol systems as they are related to practical problems in air pol-

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lution and in air cleaning operations. The program was initiated June 1, 1949. A series of technical reports and publications have been issued on the progress of the work. Theoretical studies that have been completed include:

Calculation of the Size Distribution of Aerosol Particles from Tranquil and Stirred Settling Data. Technical Report No. 1, Serial No. SO-1000, April 30, 1950.

Effect of Temperature, Density, and Velocity of Gases on Dispersion from Stacks. Technical Report No. 2, Serial No. SO-1001, June 30, 1950.

Impaction of Aerosol Particles on Cylindrical and Spherical Collectors. Technical Report No. 3, Serial No. SO-1004, March 31, 1951.

Some Aspects of the Physical Behavior of Atmospheric Aerosols. Proc. Second Nat. Air Pollution Symposium, Pasadena, Calif., May 1952.

Five experimental programs have been completed and the results reported as follows:

Impaction of Dust and Smoke Particles on Surface and Body Collectors. Technical Report No. 3, Serial No. SO-1004, March 31, 1951; published in Ind. Eng. Chem. 44, No. 6 (June, 1952).

Jet Impactors for Determining the Particle Size Distributions of Aerosols. Technical Report No. 4, Serial No. SO-1005, July 31, 1951; published in Arch. Ind. Hyg. Occup. Med. 5, 464 (1952).

Collection of Aerosol Particles by Atomized Sprays. Technical Report No. 5, Serial No. SO-1006; October 31, 1951.

Thermal Force on an Aerosol Particle in a Temperature Gradient. Technical Report No. 6, Serial No. SO-1007, December 31, 1951; published in J. Applied Phys. 23, 917 (1952).

Homopolar Electrification of Aerosols. Technical Report No. 7, Serial No. SO-1008, September 30, 1952.

An annotated bibliography on aerosols containing 1936 references was issued as a report, Serial No. SO-1003, February 1951.

The three papers which follow represent progress reports on the current work. The report by H. F. Kraemer is included because this work is a part of the general program on aerosols although it is not being done on the contract. Much credit for the success of the work should be given to the graduate research assistants. Special acknowledgment is made of the contributions of Dr. William E. Ranz, who has helped direct the work on the contract and has made many outstanding contributions to the theory of aerosols.